80/385/NP

NEW WORK ITEM PROPOSAL

	Proposer Secretary TC80	Date of proposal 2003-10
	TC/SC TC 80	Secretariat UK
Classification according to IEC Directives Supplement, Table 1	Date of circulation 2003-10-31	Closing date for voting 2004-02-06

A proposal for a new work item within the scope of an existing technical committee or subcommittee shall be submitted to the Central Office. The proposal will be distributed to the P-members of the technical committee or subcommittee for voting, and to the O-members for information. The proposer may be a National Committee of the IEC, the secretariat itself, another technical committee or subcommittee, an organization in liaison, the Standardization Management Board or one of the advisory committees, or the General Secretary. Guidelines for proposing and justifying a new work item are given in ISO/IEC Directives, Part 1, Annex C (see extract overleaf). **This form is not to be used for amendments or revisions to existing publications.**

The proposal (to be completed by the proposer)

Title of proposal

Maritime navigation and radiocommuniction equipment and systems – Electronic Chart Systems (ECS) for small craft and non-SOLAS convention craft – Minimum operational and performance requirements, methods of testing and required test results

☒ Standard	☐ Technical Specification	☐ Publicly Available Specification

Scope (as defined in ISO/IEC Directives, Part 2, 6.2.1)

To specify the minimum safe operational and performance requirements and methods of testing of electronic chart systems for small craft and non-SOLAS convention craft where no existing international standard currently exists, taking into account other associated International standards and existing National standards as appropriate.

Purpose and justification, including the market relevance and relationship to Safety (Guide 104), EMC (Guide 107), Environmental aspects (Guide 109) and Quality assurance (Guide 102) . (attach a separate page as annex, if necessary)

Electronic chart systems are presently available in a wide variety of models and configurations for ocean, coastal and riverine applications. They are in common use on small recreational craft, fishing vessels, commercial tug and tow vessels, and other workboats and government vessels that are not required to comply with the IMO SOLAS convention.

Currently there are no International Standard for these electronic chart systems, therefore an International Standard is required:

a) to provide a minimum performance standard for electronic chart systems for small and non-SOLAS convention craft where no other standards apply

b) to test that the declared performance of electronic chart systems comply with minimum standards which ensure such systems provide a safe aid to navigation and meet the manufacturers own declared objectives

Primary beneficiaries of this standard will be the end users, marine electronics manufacturers and distributors. Also, maritime authorities require such a standard as the basis for regulations governing non-SOLAS convention craft.

Note 1: Care should be taken when drafting this standard that future computational and display technology is not ruled out when drafting tests for current electronic chart systems.

Target date	for first CD Attached	for IS 2005 - 06
Estimated number of meetings 4	Frequency of meetings: 3 per year	Date and place of first meeting: TBA
Proposed working methods	☒ E-mail	☒ ftp

Relevant documents to be considered

IEC 60945, IEC 61162 series, IEC 61174, future IEC 62288, Italian National regulations (*Caratteristiche, requisiti e standard dei sistemi elettronci di ausilio alla navigazione che impiegano cartografia digitale*, Gazzetta Ufficiale n. 193 del 19/8/2002), other appropriate National regulations, RTCM PAPER 021-2003/SC109-216 "RTCM Recommended Standards for Electronic Chart Systems (ECS)" Version 3.1 (Draft), UK MCA Research Project 474 (Contract No. 6318AE3C) Final Report "The Development of Performance Standards & Operational Guidance for Transponders and Electronic Chart Systems Suitable for non-Seagoing Vessels and Other Small Seagoing Craft"

Relationship of project to activities of other international bodies

ISO 19379 Ships and marine technology – ECS databases – Content, quality, updating and testing

Liaison organizations	**Need for coordination within ISO or IEC**
RTCM, CIRM	Within TC 80 only

Preparatory work

Ensure that all copyright issues are identified. Check one of the two following boxes

☒ A draft is attached for vote and comment ☐ An outline is attached

We nominate a project leader as follows in accordance with ISO/IEC Directives, Part 1, 2.3.4 (name, address, fax and e-mail): Mr. Robert L. Feather, The Skip'r, LLC, PO Box 8217, Norfolk, Virginia 23503-0217, United States, +1 (703) 535-9908, rfeather@theskipr.com

Concerns known patented items (see ISO/IEC Directives, Part 2)	**Name and/or signature of the proposer**
☐ yes If yes, provide full information as an annex ☒ no	M Rambaut

Comments and recommendations from the TC/SC officers

1) Work allocation
☐ Project team ☐ New working group ☒ Existing working group no: WG 7

2) Draft suitable for direct submission as
☒ CD ☐ CDV ☐ Publication as a PAS

3) General quality of the draft (conformity to ISO/IEC Directives, Part 2)
☒ Little redrafting needed ☐ Substantial redrafting needed ☐ no draft (outline only)

4) Relationship with other activities
In IEC
TC80 WG7, WG13

In other organizations
ISO TC8 SC6 WG7
RTCM SC109

Remarks from the TC/SC officers

The P-members of IEC TC 80 are urged to submit comments on the draft attached.

Elements to be clarified when proposing a new work item

Title

Indicate the subject matter of the proposed new standard.

Indicate whether it is intended to prepare a standard, a technical report or an amendment to an existing standard.

Scope

Give a clear indication of the coverage of the proposed new work item and, if necessary for clarity, exclusions.

Indicate whether the subject proposed relates to one or more of the fields of safety, EMC, the environment or quality assurance.

Purpose and justification

Give details based on a critical study of the following elements wherever practicable.

c) The specific aims and reason for the standardization activity, with particular emphasis on the aspects of standardization to be covered, the problems it is expected to solve or the difficulties it is intended to overcome.

d) The main interests that might benefit from or be affected by the activity, such as industry, consumers, trade, governments, distributors.

e) Feasibility of the activity: Are there factors that could hinder the successful establishment or general application of the standard?

f) Timeliness of the standard to be produced: Is the technology reasonably stabilized? If not, how much time is likely to be available before advances in technology may render the proposed standard outdated? Is the proposed standard required as a basis for the future development of the technology in question?

g) Urgency of the activity, considering the needs of the market (industry, consumers, trade, governments etc.) as well as other fields or organizations. Indicate target date and, when a series of standards is proposed, suggest priorities.

h) The benefits to be gained by the implementation of the proposed standard; alternatively, the loss or disadvantage(s) if no standard is established within a reasonable time. Data such as product volume of value of trade should be included and quantified.

i) If the standardization activity is, or is likely to be, the subject of regulations or to require the harmonization of existing regulations, this should be indicated.

If a series of new work items is proposed, the purpose and justification of which is common, a common proposal may be drafted including all elements to be clarified and enumerating the titles and scopes of each individual item.

Relevant documents

List any known relevant documents (such as standards and regulations), regardless of their source. When the proposer considers that an existing well-established document may be acceptable as a standard (with or without amendments), indicate this with appropriate justification and attach a copy to the proposal.

Cooperation and liaison

List relevant organizations or bodies with which cooperation and liaison should exist.

Preparatory work

Indicate the name of the project leader nominated by the proposer.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS -

Electronic chart systems (ECS) for small craft and non-SOLAS convention craft - Minimum operational and performance requirements, methods of testing and required test results

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC XXX has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems

The text of this standard is based on the following documents:

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until _____. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

Electronic chart systems are presently available in a wide variety of models and configurations for ocean, coastal and riverine applications. They are in common use on small recreational craft, fishing vessels, commercial tug and tow vessels, and other workboats and government vessels that are not required to comply with the SOLAS convention.

Currently there is no International Standard for these electronic chart systems, therefore an International Standard is required:

a) to provide a minimum performance standard for electronic chart systems for small and non-SOLAS convention craft where no other standards apply, and

b) to test that the declared performance of electronic chart systems comply with minimum standards which ensure such systems provide a safe aid to navigation and meet the manufacturers own declared objectives.

Annex A forms an integral part of this standard.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS-

Electronic chart systems (ECS)- Operational and performance requirements, methods of testing and required test results

1 Scope

This standard specifies the minimum operational and performance requirements and methods of testing for Electronic Chart Systems (ECS) installed aboard small craft and non-SOLAS convention craft.

In order to better define requirements applicable to various classes of vessels operating in a variety of areas, certain parameters herein contain more than a single “standard” option. In effect, three very general classes of vessels have been identified:

Class A: represents larger vessels

Class B: represents smaller vessels primarily operating in coastal waters or inland waterways

Class C: represents vessels not covered in A or B

This standard applies to all classes of ECS unless otherwise stated by the class type being indicated in brackets, for example a clause marked (A B) would only apply to class A and B and a clause marked (C) only to class C.

Users, manufacturers, and regulatory authorities thus have a means of differentiating between the needs of various vessels.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945:2002, *Marine navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results*.

IEC 61162-1:2000, *Marine navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners* .

IEC 61174:2001, *Marine navigation and radiocommunication equipment and systems - Electronic chart display and information systems - Operational and performance requirements, methods of testing and required test results*

IEC 62288:2005, *Marine navigation and radiocommunication equipment and systems – Presentation of navigation related information – General requirements, methods of testing and required test results*

ISO 19379:2003, *Ships and marine technology – ECS databases – Content, quality, updating and testing*

IMO A.694(17):1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO A.817(19):1995 (as ammended), *Performance standards for electronic chart display and information systems (ECDIS)*

IHO S-52:1996, *Specifications for chart content and display aspects of ECDIS*

IHO S-52, Appendix 1:1996, *Guidance on updating the electronic navigational chart*

IHO S-52, appendix 2:1997 (as amended), *Colour and symbol specifications for ECDIS*

IHO S-52, appendix 3:1997, *Glossary of ECDIS-related terms*

IHO S-57:1996 (as ammended), *IHO transfer standard for digital hydrographic data*

IHO S-61:1999, *Product specification for raster navigational charts*

3 Definitions

3.1
Conspicuous features
are objects, either natural or artificial, which are distinctly and notably visible

3.2
Default ECS display
is the ECS Database content, the navigational elements, and other display items that must be displayed under certain prescribed circumstances

3.3
display resolution
is the depiction of detail, represented by the smallest distance apart at which two objects can be seen to be separate, depending on the pixel size, i.e., the size represented by a pixel, in meters on the ground, of the ECS Database as represented on the display device

3.4
ECS database
is the database issued for use with an ECS. The ECS Databse may be an electronic navigational chart (ENC), or a raster navigational chart (RNC), or a database produced from Nautical Charts and/or Nautical Publications, standardized as to content, quality and updating in accordance with ISO 19379.

3.5
ECS database resolution
is the resolution in meters on the ground of the ECS Database

3.6
Electronic chart display and information system (ECDIS)
is a navigation information system which, with adequate backup arrangements, can be accepted as complying with the up-to-date chart required by regulation V/19 of the 1974 SOLAS Convention as amended, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the operator in route planning and route monitoring, and by displaying additional navigation-related information

3.7
Electronic chart system (ECS)
is a navigation information system that electronically displays vessel position and relevant nautical chart data and information from the ECS Database on a display screen, but does not meet all the IMO requirements for an electronic chart display and information system (ECDIS)

3.8
Electronic navigational chart (ENC)
means the database, standardized as to content, structure and format, issued for use with ECDIS on the authority of government authorized Hydrographic Offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation. The content, structure and format of the ENC are specified in IHO S-57, including the associated ENC product specification.

3.9
Nautical chart or nautical publication
is a special-purpose map or book, or a specially compiled database from which such a map or book is derived, that is issued officially by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution and is designed to meet the requirements of marine navigation

3.10
Navigation mode
is an ECS operating mode in which the geographic area displayed is determined by the vessel's present position. In this mode the vessel's position is always on the display for all levels of resolution (zoom)

3.11
Non-operating mode
is an optional ECS mode which the manufacturer may make available for diagnostic and initial configuration while the system is not in service or monitoring navigational information

3.12
Operating mode
is any mode of the ECS in which the system is in service and monitoring selected navigational information, whether or not it is displayed on the screen. This includes alphanumeric display modes, menu modes, and modes where the operator can select or adjust settings. The operating modes are navigation mode and planning mode.

3.13
Operator action
is an action which is achieved by hard-key, soft-key or voice actuation, including any necessary cursor movement

3.14
Planning mode
is an ECS operating mode in which the geographic area displayed is determined by the operator for the purposes of looking ahead, studying and planning the intended route and viewing navigational notes

3.15
Raster chart display system (RCDS)
means an ECDIS displaying Raster Navigational Charts (RNCs) with positional information from navigation sensors to assist the operator in route planning and route monitoring and, if required, display additional navigation-related information

3.16
Raster data presentation
is a method of representing all, or part, of a chart digitally by a matrix-like scheme of pixels or grid points

3.17
Raster navigational chart (RNC)
means a facsimile of a paper chart originated by, or distributed on the authority of, a government-authorized hydrographic office. RNC is used in these standards to mean either a single chart or a collection of charts. The content, structure and format of the RNC are specified in IHO S-61.

3.18
Relative motion display
is a display in which own ship remains stationary, while all charted information and dynamic data such as radar targets move relative to own ship's position

3.19
System electronic navigational chart (SENC)
means a database resulting from the transformation of the ENC by ECDIS for appropriate use, updates to the ENC by appropriate means, and other data added by the operator. It is this database that is actually accessed by ECDIS for the display generation and other navigational functions, and is the equivalent of an up-to-date paper chart. The SENC may also contain information from other sources.

3.20
System raster navigational chart database (SRNC)
means a database resulting from the transformation of the RNC by the RCDS to include updates to the RNC by appropriate means

3.21
True motion display
is a display in which own ship and other dynamic data such as radar targets move with own true motion, while the position of all charted information remains fixed

3.22
Vector data presentation
is the method of representing individual chart features digitally by points, lines, polygons and text given through their coordinates, attributes and appropriate code(s)

3.23
Working database
is a database, separate from or in addition to the ECS Database, containing additions, changes and updates to the ECS Database

4 General requirements

4.1 Application of IEC 60945

Except where there is a conflicting requirement in this standard, the ECS shall meet the following requirements of IEC 60945. (See 6.3)

Clause 4.1 - General

(A B) Clause 4.2 - Design and Operation

(A B) Clause 4.3 - Power supply

Clause 4.4 - Durability and resistance to environmental conditions

Clause 4.5 - Interference

Clause 4.6 - Safety precautions

Clause 4.7 - Maintenance

Clause 4.8 - Equipment manuals

(A B) Clause 4.9 - Marking and identification

4.2 Diagnostics

a) Equipment shall be designed with either manual or automatic self-test of major hardware and software functions. Information may be provided by the manufacturer to aid the diagnosing of faults. (See 6.8.9a))

b) (A B) Prior to presenting data on the screen, the ECS shall employ diagnostic and error checking routines to ensure that the ECS Database(s) and updates, and additions made by the operator, are correctly stored within the ECS. (See 6.5c), 6.5e), 6.5f))

4.3 Power Source

(A B) The ECS shall have a primary power source. This requirement for a "primary power" source does not imply a requirement for a "secondary power" source.

a) (A B) If primary power to the ECS equipment is interrupted for a period of 45 seconds or less, the ECS shall resume operation automatically without operator intervention other than restoring power. When operation resumes, all settings, routes, destinations, zoom levels and screen displays shall be as they were before power loss, with the exception of items that are influenced by external inputs that may have changed. (See 6.9.3a)) and 6.9.3c))

b) (A B) If a secondary power source is present and primary power to the ECS is interrupted, warning shall be given to the operator. (See 6.9.3b))

5 Technical Requirements

5.1 Display of information

* Indicates that an item is part of the Default Display. The Default Display consists of the minimum ECS Database content listed in clause 5.1.1.1, the navigational elements listed in clause 5.1.2.2 and the other display items listed in clause 5.1.2.5.

5.1.1 Chart Display

The ECS shall display Nautical Chart or Nautical Publication information, and updates thereto, from the ECS Database without any degradation of information content in a manner clearly distinguishable from other displayed information.

5.1.1.1 Minimum display content

The ECS shall be capable of displaying at least the following minimum elements of a vector format ECS Database[1], and/or all elements contained in a raster format ECS Database: (See 6.5a), 6.5b), 6.8.1b))

a) Information above and below the High Water Line

   1) * At least one depth contour from the ECS Database.

   2) All depth contours up to and including a depth of 50 meters

   3) All spot soundings up to and including a depth of 50 meters

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[1] The minimum display content of a vector format ECS Database is closely aligned with the minimum content of an ECS Database specified in ISO 19379.

4) * Indication of all isolated dangers with a depth less than 50 meters (or with depth unknown, when considered dangerous to surface navigation), for example: wrecks, rocks, obstructions, offshore platforms, breakers, etc
5) Details of all isolated dangers with a depth less than 50 meters (or with depth unknown, when considered dangerous to surface navigation), for example: wrecks, rocks, obstructions, offshore platforms, breakers, etc
6) Navigable canals, navigable rivers
7) * Boundaries, for example: fairways, channels dredged areas and swept areas
8) Drying Line
9) * Coastline
10) * Bridges, overhead pipelines and cables with horizontal and vertical clearances over navigable water.

b) Navigation Aids
1) * Indication of all fixed and floating aids to navigation.
2) Details of all fixed and floating aids to navigation including, navigation markings and numbers
3) Navigation lines
4) * Traffic Routing Systems and Separation Schemes
5) Recommended routes
6) Conspicuous features

c) Other Features
1) Submarine cables and pipelines
2) Areas for which special conditions exist such as;
i) Anchorage areas
ii) * Anchorage prohibited areas
iii) * Restricted areas, for example: cautionary areas, prohibited areas, fishing prohibited areas, areas to be avoided
iv) Regulated areas, for example: fishing grounds, offshore production areas, dumping areas
v) * Military practice areas
vi) International boundaries and national limits
3) Ferry Routes
4) Nature of the seabed, for example: sand, mud, rocks, sponge, etc.

d) Textual Information
1) * Indication of cautionary notes relating to safety of navigation
2) Contents of cautionary notes relating to safety of navigation
3) Place names

e) Metadata
1) ECS Database producer and identification of the source Nautical Chart. (See 6.5b))
2) Date the ECS Database is current through. (See 6.1, 6.5b) and 6.7.1b)7))
3) The horizontal geodetic datum and the offset to WGS84 (See 6.7.1b)3)
4) Sounding Datum and Vertical Datum (See 6.7.1b)4)
5) * Scale boundaries or database resolution boundaries, if different. (See 6.8.3c))

6) Suitability of the ECS Database for a specific intended navigational purpose[2], based upon the scale and positional accuracy of the source data and the reproduction accuracy, to notify the user that the ECS Database is suitable for use in conjunction with a continuous positioning system of an accuracy consistent with the requirements of safe navigation, as shown in Table 1:

Table 1

Navigational Purpose	Scale of Source Data	Horizontal Tolerance of ECS Database
Can be used in restricted waters	≥ 1:20000	≤ 10 meters
Can be used to approach a harbour	≥ 1:50000	≤ 50 meters
Can be used for coastal navigation	≥ 1:100000	≤ 100 meters
Should not be used in conjunction with a continuous positioning system for the above navigational purposes	N/A	> 100 meters

f) Other Information

1) Horizontal units of measurement (See 6.7.1a)2))

2) * Vertical units of measurement (depth and height). (See 6.7.1b)1) and 6.7.1b)2))

5.1.1.2 Default display presentation

It shall be possible to present the Default Display from any operating mode by a simple procedure consisting of no more than two operator actions. (See 6.8.1a))

5.1.1.3 Display on power-up

When power is applied to the system, the ECS shall display the Default Display in the Navigation mode at the best ECS Database Resolution for the displayed area surrounding own ship's position, except as provided for in clause 4.3. (See 6.8.1b)

5.1.1.4 Vector display

For a vector ECS Database, it may be possible for the operator to add and remove selectively from the Default Display any categories of information without limit or restriction. An indication shall be provided when the display shows less than the Default Display. (See 6.8.2c))

5.1.2 Navigational Elements

5.1.2.1 Planning mode

(A B) In Planning mode it shall be possible to display: (See 6.9.1b))

a) Planned route

b) Operator controlled cursor

c) Waypoint

5.1.2.2 Navigation mode

In Navigation mode it shall be possible to display: (See 6.8.1b), 6.9.2b))

a) * Own ship

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[2] It should be realized that modern navigation systems (e.g., differential GPS) might offer a more accurate position than that of the source data from which the ECS Database is derived.

b) (A) Position and time (e.g., DR, EP and fix)

c) * Past track

d) (A) Time labels along ship's track

e) (A B) * Planned route (if more than one route can be displayed, the selected route shall be clearly distinguishable from other planned routes)

f) (A) Planned course and speed to make good

g) Operator controlled cursor

h) (A) Electronic bearing line (EBL)

i) (A) Variable range marker (VRM)

j) (A B) Waypoint

k) Course and speed over ground vector

l) Mark (e.g., hazard or clearing line, event, position line, rising/dipping range, wheel-over-point, etc.)

m) (A B) Ship’s heading (if connected to heading reference equipment)

n) (A B) Vessel tracking symbol (if connected to vessel tracking equipment)

o) (A B) Annotated mark (e.g., text, tidal stream or current vector, distance to run, planned position with time, etc.)

5.1.2.3 Alphanumeric data

The ECS shall have the ability to display the following measured, calculated or provided alphanumeric data: (See 6.7.1b) and 6.7.1c))

a)	Ship Latitude/Longitude	LAT/LON
b)	Speed-over-ground	SOG
c)	Course-over-ground	COG
d)	(A B) Distance to waypoint (from own-ship)	DTW
e)	(A B) Bearing to waypoint (from own-ship)	BTW
f)	(A B) Cursor range (from own-ship)	RNG
g)	(A B) Cursor bearing (from own-ship)	BRG
h)	(A B) Cross-track-distance (left/right of intended track)	XTD
i)	Datum shift or datum name	DLAT/DLON
j)	Position sensor correction	dLAT/dLON
k)	Magnetic variation	VAR

5.1.2.4 Required units

The ECS shall use the following units for display of information:

a) Position – latitude and longitude in degrees, minutes and decimal minutes (See 6.7.1a)1))

b) Distance – nautical miles, statute miles, kilometers, yards, feet or meters (See 6.7.1a)2))

c) Speed – knots or miles per hour (See 6.7.1a)3))

d) Time – hours, minutes and seconds (See 6.7.1a)4))

e) Direction – degrees (See 6.7.1a)5))

f) Depth/elevation – meters, fathoms or feet (See 6.7.1a)6))

5.1.2.5 Other display items

The ECS shall be capable of displaying at least the following in the Planning and Navigation modes: (See 6.8.1b))

a) * Chart scale bar or screen range (See 6.7.1b)3) and 6.8.3d))

b) * Orientation and direction of North, if other than North-up (See 6.8.4a))

c) * If different from WGS84, horizontal geodetic datum and an indication if a datum adjustment is applied (See 5.3.2c)), 6.6.1b) and 6.7.1b)5))

d) * Indication if own-ship position adjustments are applied (See 6.8.6d))

5.2 Provision and correction of ECS database

5.2.1 Applicable date

The ECS Database in use shall contain the date to which it is current, including Notices to Operators that have been applied. (See 5.1.1.1e)2), 6.5b) and 6.7.1b)8))

5.2.2 Chart Updating

5.2.2.1 Replacement of ECS database

The ECS shall provide a means for the operator to replace the entire ECS Database in its entirty. (See 6.5c) and 6.5e))

5.2.2.2 Update of working database

(A) The ECS shall provide the capability to update the Working Database. (See 6.5c), 6.5f) and 6.8.2)

5.2.2.3 Marking objects

(A B) The ECS shall provide a means for the operator to mark objects, or to text describing the change involved. (See 6.8.2a) and 6.8.2b))

5.2.2.4 Editing of working database

The ECS may provide the capability to edit the Working Database. When a means for manual editing of the Working Database is provided, these edits must be: (See 6.5c), 6.8.8a), 6.8.8b), 6.8.8.3 and 6.8.8.4)

a) Legible and not reduce the legibility of the surrounding navigable area

b) Stored separately from the ECS Database

c) Verifiable and distinguishable from the displayed ECS Database information.

5.3 Messages and warnings

5.3.1 Messages

The ECS shall provide messages, which may be in the form of text or other indications on the screen that alert the operator but do not require an acknowledgement. At a minimum, the following messages shall be displayed: (See 6.8.9c))

a) Display resolution is smaller than the ECS Database Resolution for the area (over-zoom condition or magnified) (See 6.8.3a))

b) (A B) In an area covered by multiple resolution data, better resolution data is available in the ECS Database (See 6.8.3b) and 6.8.3c)

c) (A B) Indication of the operating mode (i.e. Planning or Navigation) (See 6.9.1a) and 6.9.2a))

d) (A B) Screen display is less than the Default Display (See 6.8.2c))

e) (A B) ECS Database Resolution has changed automatically (See 6.8.3f))

5.3.2 Warnings

The ECS shall provide warnings in the form of audible alarms[3] and visual indications for the following conditions and require an operator acknowledgement:

a) Loss of valid positioning data (See 6.8.6b), 6.8.6c))

b) (A B) Off-course deviation limits are reached (See 5.8.1e) and 6.9.2b)4))

c) The ECS Database is not referenced to WGS-84 and a datum adjustment has not been applied (See 5.1.2.5c) and 6.6.1b))

d) Loss of valid data from external equipment (See 6.8.6b), 6.8.6c) and 6.8.9b))

e) (A B) When a secondary power source is connected to the ECS and primary power has been interrupted (See 6.9.3b))

Note: The ECS Manufacturer may provide the operator with means to reset an audible alarm after it sounds.

5.3.3 Datum warnings

When the horizontal geodetic datum of the ECS Database is unknown, or other appropriate datum adjustment has not been applied, the ECS shall provide a warning that the ECS Database should not be used in conjunction with an electronic position-fixing system (EPFS). (See 6.6.1b))

5.4 Display of additional information

5.4.1 General

If additional information is added to the ECS display, it shall match the reference system, projection, orientation and resolution of the existing display and shall be clearly distinguishable from the ECS Database information. Such additional information shall also match the true/relative motion presentation of the ECS display. (See 6.8.2a), 6.8.2b), 6.8.7a))

5.4.2 Radar information

Radar information may be added to the ECS display. Radar information may include the radar image and radar track data. When radar information is displayed, the ECS shall provide for the following: (See 6.8.2a), 6.8.2b) and 6.8.7e))

a) The radar reference point and the own-ship position from the position sensor shall be adjustable to a common reference point or to match the radar image to the ECS Database presentation. Any offset shall be clearly indicated. (See 6.8.7b) and 6.8.7c))

b) The capability shall be provided for the operator to remove the radar image and/or the vessel tracking data from the ECS display by a simple operator procedure consisting of no more than two operator actions. (See 6.8.7d))

c) Radar track data shall be displayed using the colours and symbols for published in IEC 62288.

5.4.3 AIS information

(A B) Information from an Automatic Identification System (AIS) may be added to the ECS display. (See 6.8.2a) and 6.8.2b))

a) The capability shall be provided for the operator to remove AIS information from the ECS display by a simple operator procedure consisting of no more than two operator actions.

b) AIS information shall be displayed using the colours and symbols for published in IEC 62288.

———————

3 Class C is exempt from the requirement for an audible alarm.

5.5 Display presentation modes

5.5.1 North up

It shall be possible to display the ECS Database in north-up orientation. Other orientations are permitted. (See 6.8.4a))

5.5.2 True/relative motion display

a) (A) The ECS shall provide for true-motion display. Additional display modes are permitted. (See 6.8.4c))

b) (B C) The ECS shall provide for either a true or relative motion display. Additional display modes are permitted. (See 6.8.4b) and 6.8.4c))

c) When true-motion is in use in the Navigation mode, screen redraw shall take place automatically, at a distance from the border of the display,as determined by the operator. (See 6.8.4c))

d) (A) The ECS shall provide the capability for the operator to change the position of own ship relative to the edge of the display when true-motion is in use in the Navigation mode. (See 6.8.4c))

e) (A) The ECS shall provide the capability for the operator to manually change the displayed geographic area. (See 6.8.4d))

5.5.3 Display refresh

Refresh of the Default Display in Navigation mode shall take less than 5 seconds. Demands by the operator that cannot be predicted by the ECS, such as display at a different resolution or in a different geographic area may take more than 5 seconds. (See 6.5d))

5.6 Displays

5.6.1 Colour

(A B) The ECS display shall have a colour display. (See 6.7.2b))

a) The ECS shall have, at a minimum, the capability to represent ECS Database vector data using either the colours and symbols recommended for ECDIS and published in IHO S-52, or the symbology associated with the source paper Nautical Chart of the area. (See IEC 61174 and IEC 62288.)

b) If the ECS uses colours and symbols to represent ECS Database vector data that differ from the IHO recommended colours and symbols or the source paper Nautical Chart of the area, a legend of colours and symbols shall be provided.

c) The ECS shall use the colours and symbols published in IEC 62288 to represent navigational elements and parameters.

d) Additional windows on the ECS display shall use clearly visible colours, which do not detract from the ECS display. (See IEC 62288.)

5.6.2 Monochrome

(C) The ECS display may be either colour or monochrome. (See 6.7.2b))

5.6.3 Visibility

Displayed information shall be clearly visible to an observer, in the conditions of light normally experienced on the bridge of a ship by day and by night. (See 6.7.2b))

5.7 Screen requirements

5.7.1 Character/symbol display height

a) (A) The ECS shall be capable of displaying symbols, including alphanumeric characters, with a minimum height of 3.0 mm for vector data. (See 5.6.1a), 5.6.1b) and 6.7.2c))

b) (B) The ECS shall be capable of displaying symbols, including alphanumeric characters, with a minimum height of 2.5 mm for vector data. (See 6.7.2c))

Note: Raster character/symbol heights are determined by the source data.

5.7.2 Image aspect ratio

The aspect ratio of the image displayed on the screen shall be 1:1, such that shapes are correctly proportioned. (See 6.7.2e))

5.7.3 Resolution

The ECS shall be capable of displaying the ECS Database at a Display Resolution consistent with the ECS Database Resolution. (See 6.7.2f), 6.8.1b))

5.7.4 Minimum viewable area

There are five categories of display screens with minimum viewable areas as follows:

Category 1: 460 mm (18.1 in) - diagonal measurement with 1024 x 768 pixels (See 6.7.2d)1))

Category 2: 380 mm (15.0 in) - diagonal measurement with 800 x 600 pixels (See 6.7.2d)2))

Category 3: 300 mm (11.8 in) - diagonal measurement with 800 x 600 pixels (See 6.7.2d)3))

Category 4: 240 mm (9.4 in) - diagonal measurement with 640 x 480 pixels (See 6.7.2d)4))

Category 5: 125 mm (4.9 in) - diagonal measurement with 320 x 234 pixels (See 6.7.2d)5))

The ECS shall have a viewable area meeting minimum requirements as follows: (See 6.7.2d))

(A) Category 3

(B) Category 4

(C) Category 5

5.8 Modes of operation

5.8.1 Planning mode

(A B) The ECS shall have a Planning mode that may be used by the operator to study the ECS Database and plan routes.

a) (A B) The ECS shall provide the capability for the operator to view any area of the ECS Database at various levels of zoom. (See 6.9.1)

b) (A B) The ECS shall provide the capability for the operator to plan route using rhumb line or great circle. (See 6.9.1b))

c) (A B) The ECS shall provide the capability for the operator to construct and modify routes for use in planned voyages. (See 6.9.1b))

d) (A B) The ECS shall provde the capability for the operator to construct routes that consist of both single waypoints (direct destination) and multiple waypoints. It shall be possible to modify a planned route by: (See 6.9.1b))

   1) (A B) Adding waypoints to a route;

   2) (A B) Deleting waypoints from a route;

   3) (A B) Changing the position of a waypoint;

   4) (A) Changing the order of waypoints in the route; and

   5) (A) Saving the modified route.

e) (A B) The ECS shall provide the capability for the operator to specify an off-course deviation limit from the selected route. (See 5.3.2b), 6.9.1b), 6.9.2b)4))

f) (A B) If the ECS provides for the manual entry of geographic coordinates, it shall also provide the capability to display those coordinates transformed to the datum in use. The precision of the entered data should be preserved for use in navigation calculations. (See 6.8.5b))

g) (A) The ECS shall accept a planned route by transfer from a route-planning device. (See 6.9.1c))

5.8.2 Navigation mode

The ECS shall have a Navigation mode. (See 6.9.2)

a) In the Navigation mode the ECS shall continuously plot the ship's position. (See 6.9.2b)1), 6.9.2b)2), 6.9.2b)3))

b) It shall be possible to return to the Navigation mode from any other operating mode by a simple procedure consisting of no more than two operator actions. (See 6.8.6e))

c) In the Navigation mode the ECS shall be capable of employing at least 75% of the usable screen area for the ECS Database presentation. (See 6.7.2a))

d) In the Navigation mode, any windows containing text, diagrams, etc. superimposed over the presentation of ECS Database shall be moveable or temporary. This means that the window can be moved to a less important part of the display, such as on land, or removed from the display. (See 6.9.2c))

5.8.3 Electronic position fixing system (EPFS)

a) The ECS shall accept information from navigation sensors according to the IEC 61162-1 standard.

   1) (A B) At a minimum, the ECS shall accept the GGA or GNS, GLL, DTM, ZDA, and VTG sentences, as appropriate for external equipment. (See 6.9.2b)2))

   2) (C) At a minimum, the ECS shall accept the GLL and VTG, or RMA and RMB, or RMB and RMC sentences, as appropriate for external equipment. (See 6.9.2b)3))

b) (B C) If an EPFS receiver is built-in to the ECS, an external interface is not required.

c) The ECS shall be capable of processing position input data every 2 seconds at a minimum. The latency between data input and screen-display shall be less than 1 second. (See 6.8.6a))

d) If the ECS Database is not referenced to WGS 84 and the datum or datum shift is known, the ECS shall accommodate differences between the datum of the ECS Database and the datum of the positioning system. At a minimum the ECS shall either:

   1) Accept and apply a delta-latitude/longitude to correct for datum shifts between the ECS Database, electronic position fix and other input data containing positional information (See 6.6.1a)), or

   2) Provide a means for the operator to select location data from the display in either the ECS Database datum or the positioning system datum (See 6.8.5a))

e) (A B) To compensate for positioning system errors, provision may be made for the operator to manually adjust the ship's position. This adjustment is in addition to, and separate from, the datum correction. (See 6.8.6d))

5.8.4 Track recording

a) (A) The ECS shall provide the capability to store and display past track of at least one point every 60 seconds for a minimum of 12 hours with at least one point every 4 hours thereafter. The ECS shall provide sufficient storage capacity for a voyage of 3 months duration. The ECS shall also provide the capability to preserve such data to removable media. The ECS shall not have the capability to manipulate or change the recorded information. (See 6.9.2b)5))

b) (B) The ECS shall provide the capability to store and display past track of at least one point every 60 seconds or 0.1 mile for a minimum of 60 minutes or 6 miles of data. The ECS shall also provide the capability to preserve such data to removable media. The ECS shall not have the capability to manipulate or change the recorded information. (See 6.9.2b)6))

5.8.5 Coordinate display

ECS shall provide the capability for the operator to display the coordinates of a selected position or feature on demand. (See 6.8.5a))

5.9 Calculations

The accuracy of all calculations performed by the ECS shall be independent of the characteristics of the output device and shall be consistent with the accuracy of the ECS Database. (See 6.6.2)

a) Distance and bearing calculations shall be on the reference ellipsoid associated with the datum in use. (See 6.6.2a), 6.6.2e))

b) (A) The ECS shall provide the capability to perform both rhumb line and great circle calculations. (See 6.6.2e))

c) Distances measured on the display between displayed features or selected points shall have accuracy no less than that afforded by the resolution of the display. (See 6.6.2a) and 6.6.2b))

d) The end points of lines displayed on the display screen, the result of locating waypoints or of calculations (i.e. latitude/longitude to screen X-Y) , shall be located with an accuracy no less than that afforded by the resolution of the display. (See 6.6.2d))

e) Locations of points-of-interest taken from the screen display using a cursor (i.e. screen X-Y to latitude/longitude) shall be accurate to the Display Resolution in meters. (See 6.6.2e))

5.10 ECS database

The ECS database may be either:

a) an electronic navigational chart (ENC), or

b) a raster navigational chart (RNC), or

c) a database produced from Nautical Charts and/or Nautical Publications, and standardised as to content, quality and updating in accordance with ISO 19379.

(A B) The ECS shall indicate when information from the Nautical Chart or Nautical Publication in the ECS Database in use is altered or supplemented by information from other sources. (See 6.5c))

5.11 Connections with other equipment

(A B) The ECS shall not degrade the performance of any equipment providing sensor inputs. Nor shall the connection of optional equipment degrade the performance of ECS below this standard. (See 6.2)

6 Methods of testing and expected test results

The tests specified in this Recommended Standard are defined as “performance checks” as required by IEC 60945. Performance checks are operational checks to determine that facilities provided for operational use of equipment are adequate.

6.1 Installation and technical documentation

a) The equipment under test (EUT) shall be installed in compliance with the manufacturers’ installation manual.

b) Where the EUT is divided (e.g., route planning on one display and route monitoring on another) the entire configuration shall be tested together.

c) The manufacturer shall provide sufficient information and documentation for the EUT to be installed, understood and operated.

6.2 Interfaces

(A B) For EUT that accept positioning information from navigation receivers, tests may be performed using a stimulator with internal or interfaced equipment or a simulator that transmits data using the IEC 61162-1 standard. During testing, digital signals shall be input into the EUT that contain at a minimum the position, time of position and speed over ground of the own ship. Signals may also be provided as necessary to represent radar returns appropriate to the equipment and the position of the ship. No connection of optional equipment shall degrade the performance of the EUT below this standard. (See 5.11)

6.3 Environmental

All the general requirements of IEC 60945 appropriate to its environmental category, i.e. “protected from the weather”, shall be carried out. The manufacturers shall declare any preconditioning required before environmental checks. (See 4.1)

6.4 Test preparation

6.4.1 Power-up

The installed EUT shall be powered up in accordance with the manufacturers’ recommended procedures. Signal generators shall be activated in a coherent manner to represent a stationary ship at the position selected. All the necessary selections to configure the EUT for the test environment shall be undertaken in accordance with the manufacturers’ recommendations and settings. (See 4.3)

6.4.2 Required test items

For these tests the manufacturer shall provide an ECS test database that includes the minimum content specified in annex A.

6.5 ECS test database

a) Load the ECS Test Database and observe that it contains the minimum required data elements. (See 5.1.1.1)

b) (A B) Check that the source and currency date of the ECS Test Database coverage is available. (See 5.1.1e)1), 5.1.1e)2), 5.2.1)

c) (A B) Add supplemental information from a source other than a Nautical Chart or Nautical Publication to the ECS Test Database and ensure an indication of the addition is provided. (See 4.2b), 5.2.2.1, 5.2.2.2, 5.2.2.4 and 5.10)

d) Observe that each refresh of the Default Display is completed in less than 5 seconds. (See 5.5.3)

e) (A B) Load an example of a corrupted ECS Test Database. Verify that the EUT provides a warning to the operator. (See 4.2b) and 5.2.2.1)

f) (A B) Enter an example of a corrupted update to the ECS Test Database. Verify that the EUT provides a warning to the operator. (See 4.2b))

6.6 Accuracy

6.6.1 Datum transformations

Check that the system can perform datum transformations using the scale supported by the database, i.e. not over-scaled; that the accuracy of the transformation is consistent with the ECS Database coverage:

a) Transformation between the local datum and WGS-84 if the EUT uses databases with a datum other than WGS-84; (See 5.8.3d)1), 5.9a))

b) Ensure an alarm is issued when there is no transformation to WGS-84. (See 5.1.2.5c), 5.3.2c) and 5.3.3)

6.6.2 Calculations

Check that the system can perform the following calculations using the datum and scale (or resolution) supported by the database, i.e. not over-scaled; that the accuracy of the calculations is consistent with the ECS Database coverage; and that the accuracy of measurement is consistent with the Display Resolution:

a) True distance and azimuth between two geographical points (See 5.9a) and 5.9c))

b) Geographic position from known position and distance/azimuth (See 5.9c))

c) Latitude/longitude to screen X-Y (See 5.9d))

d) Screen X-Y to latitude/longitude (See 5.9e))

e) Rhumb line and great circle. (See 5.9b))

6.7 Visual requirements

6.7.1 Units and legend

a) Check that at least the following units are included:
   1) Position – latitude and longitude in degrees, minutes and decimal minutes (See 5.1.2.4a))
   2) Distance – nautical miles, statute miles, yards, feet or meters (See 5.1.1.1f)1) and 5.1.2.4b))
   3) Speed – knots or miles per hour (See 5.1.2.4c))
   4) Time – hours, minutes and seconds (See 5.1.2.4d))
   5) Direction – degrees (See 5.1.2.4e))
   6) Depth/elevation – meters, fathoms or feet (See 5.1.1.1f)2) and 5.1.2.4f))

b) Observe that the following elements are always available for inclusion in a legend of general information:
   1) Units for depth (See 5.1.1.1f)2))
   2) Units for height (See 5.1.1.1f)2))
   3) Scale of display (See 5.1.2.5a))
   4) Sounding/vertical datum (See 5.1.1.1e)4) and 5.2.3i))

5) Horizontal datum (See 5.1.1.1e)3) and 5.1.2.5c))

6) (A B) Great circle / rhumb line indication

7) Date and number of last update affecting the ECS Database coverage currently in use (See 5.1.1.1e)2))

8) Edition date of the ECS Database coverage currently in use (See 5.2.1)

9) (A B) Chart projection

c) Observe that the following elements are available as an alphanumeric display of general information. (See 5.1.2.3)

1) Ship Latitude/Longitude	LAT/LON
2) Speed-over-ground	SOG
3) Course-over-ground	COG
4) (A B) Distance to waypoint (from own-ship)	DTW
5) (A B) Bearing to waypoint (from own-ship)	BTW
6) (A B) Cursor range (from own-ship)	RNG
7) (A B) Cursor bearing (from own-ship)	BRG
8) (A B) Cross-track-distance (left/right of intended track)	XTD
9) Datum shift or datum name	DLAT/DLON
10) Position sensor correction	dLAT/dLON
11) Magnetic variation	VAR

6.7.2 Display characteristics

a) Measure the displayed chart area while in Navigation mode and check that it is at least 75 percent of the required usable screen area. (See 5.8.2c))

b) Ensure that the displayed information is clearly visible to an observer, in the conditions of light normally experienced on the bridge of the ship by day and by night. (See 5.6.3)

c) (A B) Measure a displayed character and check that it is displayed at the specified minimum height (i.e., 3.0 mm for class A and 2.5 mm for class B). (See 5.7.1a), 5.7.1b))

d) Measure the display screen and ensure it meets the following minimum requirements: (See 11.4)

1) (A) 300 mm (11.8 in) - diagonal measurement with 800 x 600 pixels

2) (B) 240 mm (9.4 in) - diagonal measurement with 640 x 480 pixels

3) (C) 125 mm (4.9 in) - diagonal measurement with 320 x 234 pixels

e) Measure the displayed chart area and check that the image is displayed at 1:1 aspect ratio. (See 5.7.2)

f) Verify that the EUT is capable of displaying the ECS Database at a Display Resolution consistent with the ECS Database Resolution. (See 5.7.3)

6.8 Functional requirements

The following tests shall be performed in Planning mode and Navigation mode. The initial latitude/longitude position shall be consistent with the ECS Database used for the test.

6.8.1 Default Display

a) Systematically operate the EUT in each mode and check to see if the Default Display can be presented in no more than two operator actions. (See 5.1.1.2)

b) Follow the manufacturer's instructions to initialize the EUT as if power had never been applied. Enter the initial latitude/longitude position. Confirm that the scale displayed conforms to the scale of the ECS Database. Confirm that the data elements of the Default Display are shown. (See 5.1.1.1, 5.1.1.3, 5.1.2.2, 5.1.2.5, 5.7.3)

6.8.2 Additional display functions

a) If additional information can be added to the EUT display, confirm that the additional information can be displayed on demand. (See 5.2.2.2, 5.4.1, 5.4.2, 5.4.3)

b) If additional information can be added to the EUT display, confirm that additional information is clearly distinguishable from the ECS Database information. (See 5.2.2.2, 5.4.1, 5.4.2, 5.4.3)

c) If information can be removed from the Default Display, remove a standard data element and confirm that the EUT provides an indication that less than the Default Display is shown. (See 5.1.1.4, 5.3.1d))

6.8.3 Scale and navigational purpose

a) If an over-zoom capability is provided, display the information at a larger scale than that of the ECS Database (over-zoom) by zooming in, and then confirm that the indication is provided. (See 5.3.1a))

b) (A B) Display the information at a smaller scale than that of the ECS Database (under-zoom) by zooming out, and then confirm that the indication is provided. (See 5.3.1b))

c) (A B) Verify that scale boundaries or database resolution boundaries, if different, can be shown on demand. (See 5.1.1.1e)5))

d) Confirm that a scale bar or screen range can be provided as part of the display. (See 5.1.2.5a))

e) (A B) Chose an area covered by multiple scale data. Start at the smallest scale available and zoom in until an indication that data is available at a better resolution. (See 5.3.1b))

f) (A B) Load an example of an ECS Database that contains a resolution boundary and verify that an indication is provided when a vessel crosses a resolution boundary of an ECS Database. (See 5.3.1e))

6.8.4 Mode and orientation

a) Ensure that EUT is capable of displaying the ECS Database in north-up orientation. If the EUT is capable of displaying other orientations, confirm that the North direction is identified. (See 5.1.2.5b), 5.5.1)

b) If relative motion is provided for use in Navigation mode, confirm that screen redraw takes place automatically and own ship remains near the center of the display. (See 5.5.2b))

c) If true motion is provided for use in Navigation mode, reset the display and confirm that the generation of the neighboring area screen redraw takes place automatically at a distance from the border selected by the operator, keeping own-ship on screen. (See 5.5.2a), 5.5.2b), 5.5.2c), 5.5.2d))

d) Check that it is possible to manually change the chart area and the position of own ship relative to the edge of the display. (See 5.5.2e))

6.8.5 Object information

a) Select a point, which may be a feature, symbol or position, and display its geographic coordinates in either the chart datum or the positioning system datum. (See 5.8.3d)2), 12.5)

b) Enter the geographic coordinates of a position, and display that position. (See 5.8.1f))

6.8.6 Position integration

a) Connect a continuous positioning system, with an update rate of 2 seconds or less, to the EUT and verify that the correct position is displayed within three seconds after connection. (See 5.8.3c))

b) Remove the positioning input to the EUT and ensure that a screen message and acoustic alarm are given. (See 5.3.2a), 5.3.2d))

c) Simulate a message from the positioning device that indicates an error condition causing loss of positioning data, and observe that a screen message or acoustic alarm is given. (See 5.3.2a), 5.3.2d)

d) If the capability is provided, adjust own-ship position manually. Observe that the amount of the adjustment is displayed on the screen and that the position changes accordingly. (See 5.1.2.5d), 5.8.3e))

e) Systematically operate the EUT in each mode (other than the Navigation mode) and check to see if the system can be returned to the Navigation mode in no more than two operator actions. (See 5.8.2b))

6.8.7 Radar and plotting information - navigation mode only

Where the capability for displaying radar and plotting information is provided as part of the EUT:

a) Observe the display without radar overlay, switch on the radar overlay and plotting information and ensure that the ECS Database information is not degraded, and is clearly distinguishable. (See 5.4.1)

b) Observe the display at the lowest scale without radar information. Then, with the radar set to a different scale than the EUT, switch on the radar overlay and plotting information and ensure that these match in scale and orientation. Repeat for all combinations of scale settings between the radar and the EUT. (See 5.4.2a))

c) Ensure that the radar information and the displayed position of the ship may be adjusted manually; note that the accumulated offset is clearly indicated to a common reference point. Vary the radar antenna offset and confirm that the position of radar overlay and vessel-tracking data change accordingly. (See 5.4.2a))

d) Ensure that the radar and plotting information may be removed by no more than two operator actions. (See 5.4.2b))

e) If the capability is provided, set the EUT to accept and display transferred plotting targets; set the simulator to stabilized, north-up mode and to 12-mile range; check that the target information is being accepted and displayed correctly. (See 5.4.2)

6.8.8 Chart updating

a) (A) Verify that the system can receive and install ECS Database updates. (See 5.2.2.1)

b) (A) If a means is available to edit the Working Database verify the edits meet the following: (See 5.2.2.1)

   1) Legible and not reduce the legibility of the surrounding navigable area

   2) Stored separately from the ECS Database

   3) Verifiable and distinguished from the displayed ECS Database information.

6.8.8.1 Display – show and verify

(A) Display the ECS Database to ensure that the contents of the updates have been included. (See 5.2.2.1)

6.8.8.2 Manual Editing of the Working Database

(A) Check that the following manual edit procedures may be carried out and that the edits are distinguishable: (See 5.2.2.1c) and 5.2.2.2)

a) Add new features, locating them at selected positions

b) Delete an existing feature

c) Mark features for further reference

d) Add textual information

6.8.9 Self-tests of major functions

a) Perform manual or automatic self-tests of the major functions, which are supported by the EUT. Verify that the EUT provides appropriate display information and indications. (See 4.2a))

b) Simulate the following sensor malfunctions (including for radar if provided for): (See 5.3.2d))

1) Interruption of sensor input (loss of signal)

2) Invalid sensor information (status)

c) Verify that the system provides suitable alarms or indication of system malfunction arising from failures. (See 5.3.1)

6.9 Operational requirements

6.9.1 Planning mode

(See 5.8.1)

a) (A B) Ensure planning mode is indicated. (See 5.3.1c))

b) (A B) For the route to be planned as described below, the following general guidelines apply:

- The route shall be planned through an area covered by the ECS Database
- Each leg shall be planned with an appropriate off-track limit (for example 100 m.), if the capability is provided
- Course changes shall be made, both to starboard and port, between different legs of the route and shall vary from 5 degrees up to 175 degrees
- The length of the legs shall vary from 0.5 nautical miles to at least 3 nautical miles with a total length of at least 25 nautical miles
- Planned speed shall vary between 5 knots and 15 knots

c) (A B) Plan a route with at least 10 waypoints, using both rhumb line and great circle segments: (See 5.1.2.1, 5.8.1c), 5.8.1d), 5.8.1e))

1) Set the planned route

2) Retrieve the planned route and plan an alternate route

3) Add a waypoint

4) Delete a waypoint

5) Change position of a waypoint

6) Change the order of waypoints in the route

7) Save the alternate route

d) (A) Input a route from a route planning device and verify EUT will accept and process the information. (See 5.8.1g))

6.9.2 Navigation mode

(See 5.8.2)

a) (A B) Ensure navigation mode is indicated. (See 5.3.1c))

b) While testing the Navigation mode, the following general guidelines apply: (See 5.1.2.2)

- Using the manufacturers' identified database, select the Default Display and select a route
- Use the route starting at a way point

1) Observe that the display shows own ship's position (See 5.8.2a))

2) (A B) Simulate the GGA, GLL, GNS, DTM, ZDA, and VTG, HDM, HDT sentences (IEC 61162-1), as appropriate for the EUT, and verify EUT will accept and process the information (See 5.8.3a)1))

3) (C) Simulate the Recommended Minimum Sentences RMA and RMB or RMB and RMC (IEC 61162-1), as appropriate for the EUT, and verify EUT will accept and process the information (See 5.8.3a)2))

4) (A B) Simulate deviation from intended track and verify that the off-track alarm is activated (See 5.3.2b), 5.8.1e))

5) (A) Design the distance using a set of waypoints in a route to accommodate a 24-hour transit and follow this track while recording vessel movement. At the end of 24 hours, ensure the EUT has the ability to store and display past track of at least one point every 60 seconds for the most recent 12 hours. Ensure the EUT has the ability to store past track of at least one point every 4 hours after the most recent 12 hours. Verify that the EUT has sufficient storage capacity to provide for one data point every 4 hours for a voyage of three months duration. (See 5.8.4a))

6) (B) Design the distance between two waypoints in a route to accommodate a 60-minute transit and follow this track while recording vessel movement. At the end of 60 minutes ensure the EUT has the ability to store and display past track of at least one point every 60 seconds or 0.1 mile. (See 5.8.4b))

c) Verify that any windows superimposed on the chart display area can be moved to a less important part of the display, such as on land, or removed from the display. (See 5.8.2d))

6.9.3 Power supply

a) (A B) Interrupt the primary power supply for 45 seconds, and ensure that the EUT does not need to be re-initialized manually. (See 4.3a))

b) (A B) Check that proper warnings are given to the operator. (See 4.3b), 5.3.2e))

c) (A B) Operator settings shall be checked that they have not changed. (See 4.3a))

Annex A
(Normative)

ECS test database content

At a minimum the ECS Test Database[1] shall contain the following elements when available from Nautical Charts or Nautical Publications:

A.1 Information above and below the high water line

a) All depth contours up to and including a depth of 50 meters
b) All spot soundings up to and including a depth of 50 meters
c) Indication and details of all isolated dangers with a depth less than 50 meters (or with depth unknown, when considered dangerous to surface navigation), for example: wrecks, rocks, obstructions, offshore platforms, breakers, etc.
d) Navigable canals, navigable rivers
e) Boundaries, for example: fairways, channels dredged areas and swept areas
f) Drying Line
g) Coastline
h) Bridges, overhead pipelines and cables with horizontal and vertical clearances over navigable water

A.2 Navigation aids

a) Indication and details of all fixed and floating aids to navigation including, navigation markings and numbers
b) Navigation lines
c) Traffic Routeing Systems and Separation Schemes
d) Recommended routes
e) Conspicuous features

A.3 Other features

a) Submarine cables and pipelines
b) Areas for which special conditions exist such as;
    - Anchorage areas and anchorage prohibited areas
    - Restricted areas, for example: cautionary areas, prohibited areas, fishing prohibited areas, areas to be avoided
    - Regulated areas, for example: fishing grounds, offshore production areas, dumping areas
    - Military practice areas
    - International boundaries and national limits
c) Ferry Routes
d) Nature of the seabed, for example: sand, mud, rocks, sponge, etc.

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[1] The minimum display content of the ECS Test Database is closely aligned with the minimum content of an ECS Database specified in ISO 19379.

A.4 Textual information

a) Indication and contents of cautionary notes relating to safety of navigation

b) Place names

A.5 Metadata

a) ECS Database producer and identification of the source Nautical Charts and source Nautical Publications. All parts of the ECS Database compiled from sources other than the Nautical Chart or from other official government sources shall contain information in the metadata that the ECS manufacturer may use to generate an appropriate warning to the user.

b) Date the ECS Database is current through. If the database is produced from multiple Nautical Charts, then the date the ECS Database is current through should be the date associated with the latest update to the least up-to-date Nautical Chart.

c) The horizontal geodetic datum of a vector format ECS Database must be WGS-84. The horizontal geodetic datum of a raster format ECS Database should be WGS84, but it may be produced in its source datum provided the offset to WGS84 is provided in the metadata. Geodetic datum, and the offset to WGS84 if known ("Unknown" if the ECS Database includes an area for which the datum is unknown, an indication shall be provided in the metadata not available).

d) Sounding Datum and Vertical Datum.

e) Scale boundaries or database resolution boundaries, if different

f) An indication of the suitability of the ECS Database for a specific intended navigational purpose, based upon the scale and positional accuracy of the source data and the reproduction accuracy, that may be used by the ECS manufacturer to notify the user that the ECS Database is suitable for use in conjunction with a continuous positioning system of an accuracy consistent with the requirements of safe navigation, as follows:

Navigational Purpose	Scale of Source Data	Horizontal Tolerance of ECS Database
Can be used in restricted waters	≥ 1:20000	≤ 10 meters
Can be used to approach a harbour	≥ 1:50000	≤ 50 meters
Can be used for coastal navigation	≥ 1:100000	≤ 100 meters
Should not be used in conjunction with a continuous positioning system for the above navigational purposes	N/A	> 100 meters

A.6 Resolution

a) Resolution of the ECS Database is a quantity depending on the digitizing hardware and software, encoding procedures, etc. In general, it is the size (at the scale of the source document) of the smallest unit used to store positions. For vector data, it corresponds to the size of the smallest coordinate unit or sub-unit; for raster data, to the size of the pixels that the bitmap consists of. In both cases, the resolution indicates the size of the smallest spatial feature that can be discriminated, or the minimum distance between two spatial features collected as separate entities.

b) Resolution of the ECS Database shall be such to ensure that the ECS may generate a detailed, truthful and comprehensible representation of the information derived from source documents, when the ECS Database is displayed at the same scale as the source. In any case, resolution shall be not coarser than 0,2 mm at scale 1:1, or 0,2*N mm at scale 1:N on the source. For example:

Scale	Ground Resolution not worse than:
1:1000	0,2 meter
1:10000	2,0 meter

1:50000	10,0 meter

A.7 Reproduction accuracy

a) Reproduction accuracy is defined as the true distance (at the scale of the source document) between the geographic position of a given feature as provided by the source and the position of the corresponding entity as reproduced in the ECS Database.

b) In theory, reproduction accuracy should be expressed in units of resolution (meaning that it cannot be better than resolution). For the purpose of this standard however, accuracy requirements are defined by an absolute value. Reproduction accuracy of any element of the ECS Database shall be not worse than 0,5 mm at scale 1:1, or 0,5*N mm at scale 1:N on the source.

A.8 Other information

The ECS Database should include other information necessary for the ECS manufacturer to work with the ECS Database such as horizontal and vertical units of measurement, etc.

Annex B
(Informative)

Bibliography

A number of documents are recommended as sources of useful information, although they do not constitute provisions of this standard. These informative references are listed below:

a) International Maritime Organization, International Convention for the Safety of Life at Sea, 1974

b) National Marine Electronics Association, NMEA 0183 Standard for Interfacing Marine Electronic Devices, Version 3.0.